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ABSTRACT

The controversy over the optimal age for learning a second language is discussed, examining, from the perspective of Piagetian theory: (1) the argument which suggests that children have an advantage in language learning; and (2) the arguments which states that adults have an advantage in language learning. The first part provides an overview of the short- and long-term studies on child/adult differences that have led to the controversy, and points out some of the problems inherent in carrying out such studies. In part two, the major factors that have been suggested to account for age differences in second language learning are outlined. It is then argued that these factors fail to satisfactorily account for the differences between younger and older learners in both learning rate and ultimate attainment, thus biasing conclusions about optimal age; a resulting "disequilibrium model" of language learning is proposed. This model attempts, through application of the Piagetian concept of equilibration, to find a common ground on which the results of both long- and short-term studies can be examined collectively. It is concluded that determinations of optimal age in second language learning are incidental rather than substantive. A 65-item bibliography is included. (MSE)

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OPTIMAL AGE REVISTED - A PIAGETIAN PERSPECTIVE

Frances Tsakonas

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INTRODUCTION

No doubt, we have all heard the popular belief about second language learning(1) - that is, that learning a second language at a younger age is better than learning a second language later in life; and, that younger acquirers will always outperform older acquirers.

In recent years however, there has been much controversy amongst L2 researchers over what is in actual fact the optimal age for learning a second language - younger or older. Although this controversy has come about due to evidence provided by each faction of L2 researchers in support of their 'optimal age' group, at the root of the debate (ie: who is better at L2 acquisition - younger of older learners), lies not age, but disconformity amongst L2 researchers as to the definition assigned to the word 'better' and thus, the experimental evidence used to support their hypothesis. For example, those researchers who support the notion that younger is better (or, the optimal age for learning a second language), equate 'better' with ultimate attainment in L2 acquisition and base their argument on results obtained from long-term studies; whereas those who support the notion that older is better (or, the optimal age for learning a second language), equate 'better' with rate of L2 acquisition and base their argument on results obtained from short-term studies.

In light of such disconformity, it is therefore astounding to find renowned L2 researchers make such general statements about L2 acquisition as for example, the following:

> ".....our results indicate that age confers a significant and strong advantage in second language acquisition..... for second language learners, older is better ....." (2)

The reason is, that conclusions about 'advantage', or about who is 'better' in L2 acquisition, cannot and should not be drawn from either short-term or long-term studies alone. If advantage (or, optimal age) in L2 acquisition need be conferred, then both long- and short-term studies should be considered before generalizations are made about the superiority of one age group over the other. Moreover, since the term 'second language acquisition' refers not only to the development of phonology, lexis, grammar, and pragmatic knowledge, but also to the subconscious or conscious processes by which a language other than the mother tongue is learnt in a natural or a tutored setting (Ellis 1986), evidence should be provided in all these areas before age can clearly be said to confer 'advantage' in L2 acquisition, and before it can be concluded that older is truly 'better'.

Nevertheless, the kinds of child-adult differences that are revealed in L2 acquisition studies (such as rate and ultimate attainment), have clear theoretical and practical significance. For example, educators are interested in knowing the optimal age to begin instruction in L2, and want to know just how far older students can progress since "only when this has been examined, can one deal with another important practical question: whether students of different ages need different methods or approaches in studying foreign and second languages".(3) Moreover, "any successful theory of second language acquisition must be able to account for observed differences in second language development in children and adults".(4)

In this paper then, both sides of the optimal age argument will be revisited and examined through a Piagetian perspective. The writer's purpose is not to show who is a better L2 learner - the child or adult - or where the advantage lies, but to examine the arguments put forth by supporters of each 'camp'.

This paper moreover, is born of the conviction that conclusions about optimal age in L2 learning cannot be drawn until common ground has been found upon which the results of both long- and short-term studies can be examined collectively. Such common ground, the writer proposes, can be found in what Piaget calls, the process of 'equilibration'.(5) This will be explained in Part 3.

First and foremost however, it is essential to look at the long- and short-term studies on child-adult diffferences whose findings are responsible for the controversy over optimal age in L2 acquisition. Part I therefore, gives a brief overview of both the long- and short-term studies on child-adult differences which have ultimately led to the controversy over optimal age in L2 learning, and points out some of the problems inherent in carrying out such studies.

In Part 2, the major factors that have been suggested to account for age differences in L2 acquisition, are outlined. However, as these factors fail to satisfactorily account for the differences between younger and older learners in both rate and ultimate attainment - thus rendering conclusions about optimal age in L2 learning biased, the 'Disequilibrium Model' is proposed in Part 3.

With the presentation of the 'Disequilibrium Model' moreover, a hypothetical construct can be used to encompass age differences reflected in both long- and short-term studies and thereby enable their collective examination. Furthermore, by using the 'Disequilibrium Model' to diagrammatize age difference in L2 acquisition, it becomes clear that conclusions about optimal age in L2 learning are incidental rather than substantive.

PART I: STUDIES ON CHILD-ADULT DIFFERENCES IN L2 ACQUISITION

> "Direct comparison between young children and adolescents or adults acquiring a second language is difficult because of several factors. First, the criterion for success is vastly different for the child as compared to the adult. Children are considered fluent when they can communicate at a level appropriate for their age. An adult must communicate with other adults about much more complicated issues, where deficiencies in vocabulary and syntax show up more readily. It is also difficult to hold constant such factors as motivation to learn and exposure to the second language across different age groups". (6)

Another factor moreover, which makes comparison between younger and older subjects difficult, is the differences in test-taking abilities of these two age groups. Although such differences are difficult to control (7), many L2 researchers insist on comparing younger with older learners.

1. Long-Term Studies

Long-term studies of children and adults examine ultimate attainment in a second language. It can be deduced from these studies moreover, that age at the beginning of second language acquisition, is the most highly associated independent variable with eventual attainment. That is, those who start learning the L2 as children attain higher levels of proficiency in the long run, than those who start as adults. (8) Moreover, the length of exposure does not seem to be a factor for long-term studies beyond 5 years approximately (9) because "the effects of exposure have by and large levelled off". (10)

Unfortunately, there are only a few such long-term studies, the earliest of which deal mainly with pronunciation (see Asher and Garcia (1969); Seliger, Krashen, and Ladefoged (1975); and Oyama (1976)). However, the work of Oyama (1978) and Patkowski (1980), makes it clear that the ultimate superiority of children over adults extends to other parts of language, such as sentence comprehension and syntactic proficiency. Patkowski's analysis moreover, confirms that those starting as children are not ultimately better simply because they have had more time to practice than those starting later in life - as maintained by some researchers (see for example, Burstall, 1975).

2. Short-Term Studies

Short-term studies comparing children and adults, show adults to be superior to children in rate of L2 acquisition. That is adults proceed through early stages of syntactic and morphological development faster than children - where time and exposure are held constant (11). Moreover, the same seems to hold true for older children when compared with younger children.

Unlike the availability of long-term studies, short-term studies seem to enjoy greater popularity amongst L2 researchers. Not only are studies available in which children have been compared with adults (Asher and Price, 1969; Olson and Samuels, 1973; Snow and Hoefnagel-Hohle, 1978a; Snow and Hoefnagel-Hohle, 1977), and where the effects of exposure and treatment vary (12), but there are also studies which compare younger and older children in (a)informal environments with similar length of exposure (Ekstrand, 1976; Fathman, 1975; Snow and Hoefnagel-Hohle, 1978a; Ervin-Tripp, 1974); (b)formal or experimental environments with similar treatment (Ekstrand,1978; Asher and Price,1969; Olson and Samuels,1973; Florander and Jansen, 1979; and Grinder, Otomo, and Toyota, 1962); and (c)formal environments with dissimilar amounts of exposure (Burstall,1975; Bland and Keisler,1966; Oller and Nagato, 1974; Ramirez and Politzer, 1978; and Vocolo 1967).

Although the difference between classroom experience and being immersed in the 'new' language must not be overlooked, the results of short-term studies comparing older and younger subjects consistently show older subjects to be faster learners of syntax and morphology when the duration of the exposure to the second language is similar, whether the exposure to the second language is in natural or formal environments. The studies of Ervin-Tripp (1974), and Ekstrand (1976) moreover, report that older children acquire phonological competence (pronunciation) somewhat faster than younger children - although statistically "there is no appreciable difference". (13)

By comparing long- and short-term studies, it seems reasonable to conclude that younger children eventually 'catch up' to older children, and even surpass the adults. This 'catch up' process for morphology and syntax takes about one year where younger children and adults are concerned, and just over a year where younger and older children are concerned (Snow & Hoefnagel-Hohle, 1978b). With regard to pronunciation, although younger children learn at the same rate or more slowly than older learners, they are more likely to go further in the long run (Krashen et al., 1982).

Nevertheless, as Hakuta (1986) so wisely states:

> The conclusions drawn from the studies require some rigorous examination and qualification.

The short-term (or, initial gains) studies for example, suggest that "getting older means getting smarter, and the smarter you are, the better you should be at learning most things, second language included". (14) A logical argument, no doubt! But how logical is it to compare the test results of an adult with those of a child as the short-term studies do? The older subjects clearly have an advantage since, their attention span, memory capacity, ability to decipher the experimenter's intentions, and test-taking experience (Hakuta, 1986), aid in their L2 performance.

Long-term studies are also not without problems. "These studies indicate that with increasing age there is a steady decline in the extent to which a second language is acquired". (15) This in turn, has led to the popular belief that the optimal age for learning a second language is before puberty in order to acquire native-like use of the second language. The "critical period" hypothesis, most strongly advanced by Eric Lenneberg (1967) and Penfield and Roberts (1959) (16), as well as evidence of brain lateralization from studies on aphasia(17), have mainly contributed to this belief.

However, although findings on the neurological evidence for age limits on the acquisition of the native language are of considerable import, it seems that "once language is acquired, there does not seem to be any physiological or psychological impediment to learning a second language if the opportunity and motivation are present - in the environment"(18). Moreover, evidence from short-term studies of L2 acquisition does not support the notion that children possess special, biologically based language abilities that give them an advantage over adults in language learning. (19)

PART 2: WHY DO THESE AGE DIFFERENCES EXIST?

> If it is not something like a critical period that differentiates between children and adults, then what is it?
>
> - K. Hakuta (1986)

The results of empirical research on age differences in L2 acquisition have, needless to say, led to much theorizing about why these differences (20) exist. A whole array of variables - ranging from 'internal' qualities to 'external' situational factors - have been put forward.

1. Major Factors Affecting Rate and Ultimate Attainment in L2 Acquisition

a. Input

Scarcella and Higa (1981), in attempting to explain rate of L2 acquisition differences between younger and older learners, argue that it is not simplified input (21) - which studies indicate children receive (22), that facilitates the rate of L2 acquisition, but rather the adults'ability to manage conversations, and thereby obtain necessary input.

They found, for example, that although "[a]dult native English speakers do much more negotiation work in conversations with younger second language learners than they do with older learners" by providing "larger quantities of simple input, a more supportive atmosphere, and a constant check to see that the input the child receives is both attended to and understood"(23), younger learners do not have an advantage over the older learners in terms of rate of L2 acquisition. As the short-term studies on L2 acquisition show, older learners acquire the L2 at a faster rate (in the early stages) than the younger learners.

Simplified input therefore, cannot be said to aid in the process of L2 acquisition. Chomsky moreover, argues that 'degenerate' input is inadequate for acquisition. However, he goes too far in equipping the learner with a language acquisition device, and emphasizing learner-internal factors (Cook, 1985) just as the behaviorists, following Skinner's lead, went too far in trying to explain progress in language acquisition purely in terms of what happens outside the learner (Rivers, 1964). It seems more appropriate to treat acquisition of language as the result of an interaction between the learner's mental abilities and the linguistic environment. As Ellis (1986) maintains,

> Language acquisition derives from the collaborative efforts of the learner and his interlocutors and involves a dynamic interplay between external and internal factors.

Stevick (1976), moreover, believes that it is the learner's active involvement in the language interaction that facilitates language acquisition. For example, "when speaking to children, the adult native speaker carries a greater responsibility and often dominates the conversation by using frequent rhetorical questions and repetition" (24), and so, although the younger learner may receive more simplified input, this may not contain the structures and vocabulary which the child can understand. However, the older learner's active work in sustaining the interaction in order to get just those parts of the input explained which s/he does not understand, results in larger quantities of comprehensible input (25) which is closely attended to (Scarcella & Higa, 1981).

This may - to some extent - explain why adults acquire the L2 at a faster rate (during the early stages), although it cannot in itself account for age differences.

Scarcella's and Higa's (1981) argument therefore - that is, that "the simplified input the younger learner receives is not as 'optimal' as the input the older learner receives through the work of negotiation" - leaves an important question unanswered. That is, how is it that younger learners do ultimately attain higher levels of L2 proficiency as shown by the long-term studies? An hypothesis will be proposed in Part 3, in an effort to resolve this dilemma.

b. Affective State

> When [the student of the second language] tries to express what he is really thinking he lapses into the modes of expression of his own language and is rebuked. He must think and talk for a while in an unreal world where you say not what you want to say but only what can be concocted from the few foreign-language forms you know, no matter how infantile or how irrelevant to real-life affairs it may seem.
>
> - W.M. Rivers (1964)

Many authors (amongst these: Gardner and Lambert, 1972; Curran, 1976; Schumann, 1975; Neufeld, 1978; Brown, 1980) have stressed the role of affective variables (26) in L2 development and have used such variables to explain child-adult differences in L2 acquisition. It seems moreover, that a strong case in favor of the younger age as 'optimal' in L2 learning can be built around the younger learner's more conducive (to L2 acquisition) affective state.

For example, Stengal (1937) notes that adults are often haunted by doubts as to whether their words actually reflect their ideas, whereas the child is less worried about this, sees language as a method of play and finds communication a source of pleasure (27). At around puberty however, a clear turning point in second language acquisition corresponds to obvious changes in personality and attitude. (28)

> As puberty approaches and the individual is concerned with the consolidation of his personality, it apparently becomes more difficult for him to submit to the new norms which a second language requires.(29)

But as McLaughlin (1984) points out, although affective variables set limits to what is learned they do not affect the basic process. (30)

The fact that younger learners are capable of attaining higher levels of L2 proficiency may be due, in part, to their socio-cultural resilience since they are less culture-bound than adults (Brown, 1980). Moreover, younger learners are more highly integratively oriented and this provides them with a more positive attitude towards the target culture (Gardner and Lambert, 1972). Krashen (1982) hypothesizes that performers with 'optimal' attitudes will simply obtain more input by attempting to communicate more with speakers of the target language than performers with less than optimal attitudes; and, performers with better attitudes will be more 'open' to the input. (31)

The studies of Schumann (1978) and Shapira (1978) show that adults are more instrumentally motivated. We can expect threfore, that they will proceed in L2 acquisition only as far as they need to, in order to 'get the job done'.

Ego permeability may also account for younger learners attaining higher levels of L2 proficiency than older learners. Guiora (1972) maintains (32) that:

> In the course of general ego development, the child acquires a sense of the boundaries of his language. The sounds, words, syntax, and morphology of his language become objectified and develop firm outlines and boundaries. In the early stages of development, language ego boundaries are permeable but later they become fixed and rigid.

Another convincing argument is that of Neufeld's (1978). He proposes two levels of language - 'primary' (which includes a large functional vocabulary, and basic mastery of pronunciation and grammatical rules), and 'secondary' (which include the ability to handle complex grammatical structures and different language styles). He believes that all learners are able to acquire primary levels, but children are more likely to achieve secondary levels than adults because they are more integratively motivated.

In light of these arguments, Krashen's (1982) 'filter' hypothesis seems reasonable. That is, as the child grows older, the 'filter' is strengthened; this in turn means that the earlier one is exposed to a second language (33) the greater the chance of reaching Neufeld's 'secondary' levels of language. However, if as Krashen says the 'affective filter' is strengthened with age, then how is it that the older learners (ie: those who start L2 acquisition later in life) do in fact acquire the L2 at a faster rate? One explication may be found in the argument that older learners are more instrumentally motivated and so, need as quickly as possible to 'get the job done'. However, a more convincing alternative will be proposed in Part 3.

c. Cognitive Development

One obvious difference between younger and older learners is their level of cognitive development (34), which in turn, results not only, in a different orientation to language(35), but also, in different categories of mental representations(36).

A series of natural, maturational stages in cognitive or intellectual development have been identified (37), and related to language development, by the famous genetic epistemologist Jean Piaget (38). However, as there is now a wealth of empirical evidence (eg: Bates & MacWhinney, 1982; Macnamara, 1972; Sinclair-deZwart, 1973; Slobin, 1979)

supporting the fact that progress in conceptualization goes hand in hand with progress in language, one does not have to accept Piaget's theory to accept this fact.

> The exact nature of the cognitive prerequisites for language is still debated, although there is general agreement that the language acquisition process involves the assimilation of information into existing cognitive structures and that these cognitive structures set limits on the child's language development.
>
> - McLaughlin (1984)

Nevertheless, as Piaget's work became better understood, some L2 researchers began to relate their studies of L2 acquisition to this growing body of experimental research findings (39). Rosansky (1975) for example, in an effort to explain age differences in L2 development, maintains that L2 development is related to perceptual awareness. For example, she believes that the young child, at Stage I (preoperational thought) of Piaget's stages of cognitive development, is capable of 'automatic' language acquisition due to the absence of meta-awareness associated with the following characteristics: (a) the young child can see only similarities - since egocentric thought dominates at this stage of cognitive development, and therefore the child can focus only on one dimension or factor; (b) identifies, rather than solves problems; and (c) is not capable of flexible thinking.

It seems reasonable to conclude therefore, that not only does the young child not know that s/he is acquiring language (40), but that s/he cannot develop 'language' (either L1 or L2) that is above and beyond the scope of cognition (41). The rate of L2 acquisition for the young child would thus appear to be slower than that of the older learner since the young child is still in the process of cognitive 'maturation', and so, is at a (cognitive) disadvantage when his/her performance on L2 tasks, during short-term studies, is compared with that of older learners'. For example, Brown

and Fraser (1963) have shown some processing limitation that restricts the length of utterances children can program, thus providing evidence of "a processing restriction imposed by the limitations of operative memory" (42). However, as children grow older, this limitation is gradually overcome and sentences become longer (43). This was also maintained by Bloom (1970) who found that deletions seem to occur in the negative sentences of children, possibly due to the fact that negative sentences are usually one word longer, and so the addition of a negative element would require that some other constituent of the sentence be dropped. Olsen (1973) moreover, argued that young children do not organize, plan, monitor, and integrate their information processing and memory as efficiently as do older children and adults.

> Children have fewer automatic processes in long-term memory: they have less experiential knowledge, a smaller lexicon, and fewer retrieval devices. In contrast, adult performance involves the ability to plan and organize output, the ability to monitor and assess the state of this planning and the readiness to perform, the ability to integrate in real time the flow of information through immediate memory and to retrieve information from long-term memory. In addition, adults have a conceptual repertoire and previous learning experience at their disposal.
>
> - McLaughlin (1984)

As the child grows older, s/he gradually acquires the ability to think abstractly and flexibly, to recognize differences as well as similarities, and to become increasingly de-centered. As a result, s/he possesses meta-awareness of this developing system of abstractions, and so is capable of reflecting on

the rules s/he possesses and on his/her thoughts. The meta-awareness that comes with this cognitive development moreover, may facilitate more efficient learning (as a conscious process, in contrast to subconscious language acquisition) as Krashen (1982) maintains. Furthermore, Ellis (1986) believes that "[n]ot only can the [older learner] 'pick up' language like a child, but he can supplement this process by conscious study" (44). This, in turn, may allow an adult to progress faster during the initial stages of L2 development in the areas of syntax, morphology, listening comprehension, vocabulary - as shown in the short- term studies - where more 'sophisticated' (cognitive) processing is required, but does not explain why there is no appreciable difference in rate of L2 pronunciation. Perhaps, the reason for this is that, since pronunciation is a reproductive skill (45), the ability to focus on similarities (which characterizes younger learners) is more important than the ability to see differences, and "of all aspects of language ...least amenable to conscious manipulation" (46).

Nevertheless, it would seem logical to conclude that, according to the cognitive argument, the optimal age for learning a second language is when the cognitive processes have matured - that is, from early adolescence and beyond. But, can age differences in cognitive development so simply account for differences in rate of L2 acquisition - that is, by attributing differences in rate to the more 'advanced' processing capacity of the older learners? Moreover, what about age differences in ultimate attainment in L2 acquisition as shown by the long-term studies? Is the starting age of L2 acquisition (ie: the stage of cognitive development at which the learner finds him/herself when commencing L2 acquisition) related to ultimate attainment in the L2? The 'cognitive' argument, says nothing about the fact that children typically outperform adults in L2 performance over the long run.

Each of the above mentioned factors account, to some extent, for age differences in rate and ultimate attainment in L2 - although each, in its own discrete way. However, it is clear that conclusions about optimal age in second language learning can not and should not be drawn from any one of these factors alone.

PART 3: 'EQUILIBRATION': ACCOUNTING FOR AGE DIFFERENCES IN RATE AND ULTIMATE ATTAINMENT IN L2 ACQUISITION

As mentioned earlier, this paper is born of the conviction that conclusions about optimal age in L2 learning cannot be drawn until common ground has been found upon which the results of both long- and short-term studies can be examined collectively. Such common ground can be found when the results of L2 acquisition studies are looked at in relation to the process of 'equilibration'(47) as put forth by Piaget.

> For Piaget, equilibration is, at all levels of analysis, the dynamic of cognitive change without which the effects of maturation, physical experience, and social experience can not be understood or explained.
>
> - D. Elkind (1968)

Although Piaget in his writings concerns himself with the role of the concept of equilibrium in psychological explication, models of equilibrium are to be found in mechanics, in thermo-dynamics, in physical chemistry, in biology, in econometrics, etc.(48) Equilibrium moreover, seems to be an intrinsic and constitutive property of organic and mental life. For example, each state of biological equilibrium (say, satiation) is preparatory to a new disequilibrium (say, hunger). On the mental plane, each new level of conceptualization establishes a new equilibrium but also opens the subject to new forms of information and new possibilities of contradiction. There seems to be, therefore, a natural 'pull' towards equilibrium. It should follow then, that the greater the disequilibrium, the greater the 'pull' towards equilibrium.

Most importantly however, Piaget's concept of equilibration, is dialectical in nature, regulating the interaction of maturational and environmental influences, while at the same time providing the dynamic or growth principle which governs both the acquisition of knowledge and the structures necessary for this acquisition.

> At each level of development there are two poles of activity: changes in the structure of the organism in response to environmental intrusion (accomodation), and changes in the intruding stimuli due to the existing structure structure (assimilation). These two poles of activity constitute a sort of thesis and antithesis whose eventual synthesis is effected by a process of equilibration.
>
> - D. Elkind (1968)

It is this process of equilibration that the writer believes governs both rate and ultimate attainment in L2 acquisition - making it extremely difficult to draw conclusions about optimal age in L2 learning. For example, as noted in section 2c above, there is a great deal of evidence supporting the fact that progress in conceptualization goes hand in hand with progress in language; but it is only after the process of equilibration that new information about language is assimilated into existing cognitive structures (49). These cognitive structures set limits on language acquisition by determining one's orientation to language and the development of different categories of mental representation (or, schemata) of language - until the next stage of disequilibrium (leading in turn to a new stage of equilibration). Moreover, since language acquisition is dialectical in nature, "[t]he learner, while constructing a schema (50), is engaged in an act that involves information from the environment as well as his/her own cognitive mechanisms"(51).

If this fundamental interaction between internal and external factors is taken into account when considering L2 acquisition, it should follow then, that L2 acquisition is an assimilation of the L2 to prior L1 schemata, and all L2 development is at the same time an accommodation of these schemata to the L2 situation/experience. The dialectical nature of this process (ie: of L1-L2 equilibration) moreover, predicts a change in state from one approximative system to the next. However, if, as noted above, there is a natural 'pull' towards equilibrium, then, the greater the difference perceived between L1 and L2, the greater will be the 'pull' towards equilibrium (ie: the rate of L2 acquisition will increase).

This could account therefore, for older learners' faster rate in L2 acquisition (in the early stages) as shown by the short-term studies, since there is greater disequilibrium that results due to the gradually acquired ability to discern differences (52). This can be represented diagrammatically by the hypothetical construct the writer has called, The 'Disequilibrium' Model of L2 Acquisition (see Fig. 3.1).

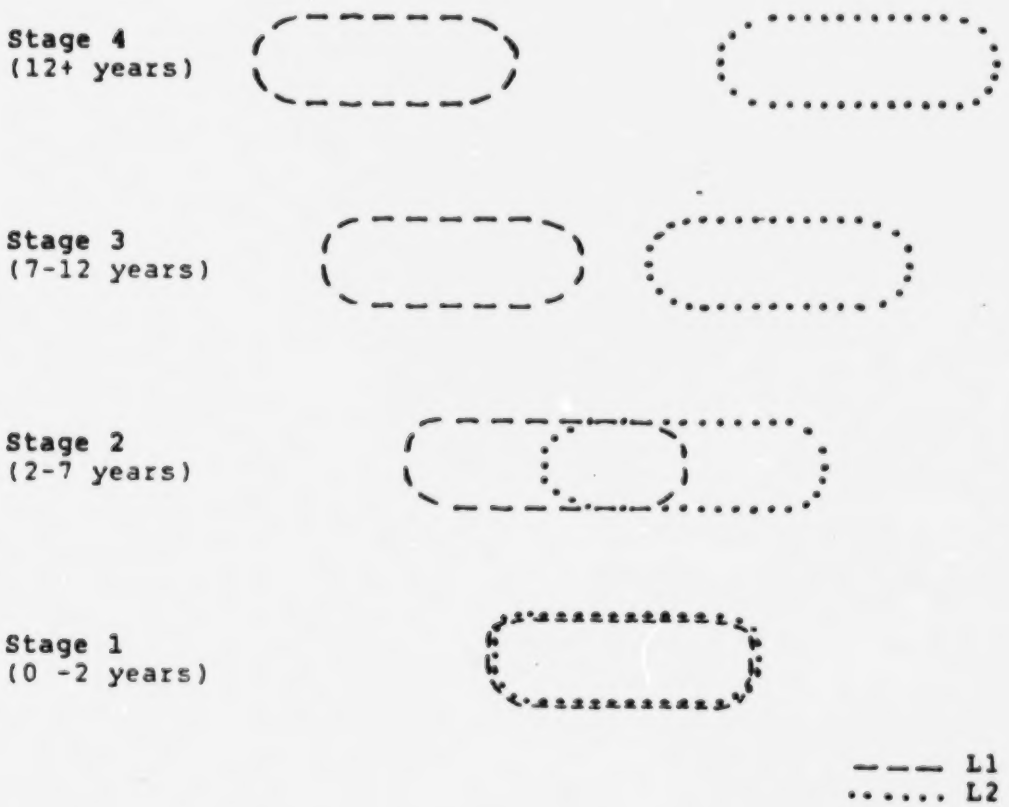

Fig. 3.1: The 'Disequilibrium' Model of L2 Acquisition: Rate of L2 Acquisition as a Function of Disequilibrium

As The 'Disequilibrium' Model is born of Piaget's concept of equilibration, and since, for Piaget, "equilibration is, at all levels of analysis, the dynamic of cognitive change without which the effects of maturation, physical experience, and social experience cannot be understood or explained", the 'Disequilibrium' Model of L2 Acquisition is consistent with Piaget's stages of cognitive development.

If a child is introduced to a second langauge during Stage 1 (0-2 years), for example, the stage of sensorimotor or practical intelligence, the L1 and L2 are acquired simultaneously and, at the Stage of cognitive development, the child does not have the intellectual capability to differentiate the two language systems. It is for this reason that the L1 and L2 are shown in the diagram (see Fig. 3.1) to occupy a common area.

The simultaneous acquisition of L1 and L2 and their undifferentiation at Piaget's first stage of cognitive development (the Sensorimotor Stage) has been substantiated by a number of L2 researchers. McLaughlin (1984) for example, states that "[t]he child who is introduced to a second language before 3 years will be regarded as acquiring the two languages simultaneously" and "[d]uring this period, words and sounds can be mixed". However, the landmark study of simultaneous acquisition of two languages is the study made by Leopold (53) of his daughter's (Hildegard) acquisition of German and English. Regarding this, Hakuta (1986) notes that:

> The bulk of Leopold's detailed observations concern Hildegard's development through the end of her second year. During the first two years, although she was spoken to in different languages by her parents, she did not associate the languages with specific persons.....In general, Hildegard did not separate the two languages in her vocabulary. During these years, English and German synonyms appeared to be in competition, occasionally coexisting.

At Stage 1 therefore, there is no apparent disequilibrium between the two language systems (ie: L1 and L2).

> In general, the initial stage of bilingual acquisition is characterized by a lack of differentiation between the two languages. The child considers the two languages of his or her environment to be a single language.
>
> Hakuta (1986)

Moreover, "[t]he fact that children do not discriminate in their use of languages depending on the person with whom they are talking, even in cases where the parents speak different languages, attests to the generality of what they are learning when they acquire language". (54)

As the child moves into Stage 2 (that is, somewhere between the ages of 2 and 3) and becomes capable of operational thought, gradual differentiation of the languages can be discerned. Although "[t]he case studies do not tell us how this differentiation takes place....they amply record the fact that it may occur at a relatively young age".(55)

> By the age of three to four, languages are rarely mixed ...
>
> Hakuta (1986)

What is important however to note, is that differentiation at this Stage of cognitive development (2 - 7 years), is dominated by the child's ability to focus on similarities rather than differences - and this because the child is capable of focusing on one dimension or factor at a time (56). The fact therefore, that "[b]y the age of three to four, languages are rarely mixed"(57) is most likely due to the child's ability to group similarities rather than separate differences.

Nevertheless, from the moment the child becomes consciously aware that s/he has more than one language system at her/his disposal, the process of equilibration (with respect to the development of the languages) is put in effect. However, as Stage 2 is a transitional period, the disequilibrium which is created between L1 and L2 at this Stage is minimal at first (due to the child's inability to discern differences) and gradually increases as the child approaches Stage 3. This

transition from Stage 1 of simultaneous acquisition of L1 and L2 to Stage 3 when differentiation of the two languages is complete, can best be diagrammatized by two overlapping circles (see Fig. 3.1).

As the two language systems become all the more differentiated as one looks at L2 acquisition during Stage 3 and Stage 4, the disequilibrium between the two language systems becomes greater. However, as the disequilibrium increases, so does the 'pull' towards equilibrium. It can therefore be said that the rate of L2 acquisition (58) is a function of the disequilibrium which is created in trying to accomodate the L2 into the existing L1 system.

For example, if a child starts learning a second language during Stage 3, the disequilibrium created will be greater than that created if s/he started learning the L2 during Stage 2 since at Stage 3 s/he is capable of discerning both differences and similarities between the two language systems. Likewise, if one starts learning a second language during Stage 4, the disequilibrium created will be greater than that created if one had started learning the L2 during Stage 3 since at Stage 4 one is capable of focusing on multiple hypothetical factors. And, the greater the disequilibrium, the greater the rate of L2 acquisition - which is why the short-term studies show adults acquiring the L2 at a faster rate.

The 'Disequilibrium Model' moreover, can be used to explain age differences in ultimate attainment in L2. For example, if a child who is introduced to the L2 during Stage 1 (59), and continues through Stages 2,3, and 4 with the quality and quantity of L1 and L2 constant, then s/he would ultimately appear to have achieved 'complete' bilingualism. This can be represented as follows:

Fig. 3.2: Ultimate Attainment in L2 with Starting Age Stage 1

It is reasonable to hypothesize moreover, that since there is a natural tendency towards equilibrium, so too, there is a natural tendency for the 'circles' representing the two language systems in the Model, to converge - although the degree to which they converge is a function of the age at which L2 is first introduced. This is supported by the results obtained from the long-term studies. That is, the younger the learner is when first introduced to the L2, the greater the proficiency ultimately attained in the L2.

Ultimate attainment in L2 - for L2 introduction at Stage 2, Stage 3, and Stage 4, respectively (with the quantity and quality of L2 constant) - can thus be represented as follows:

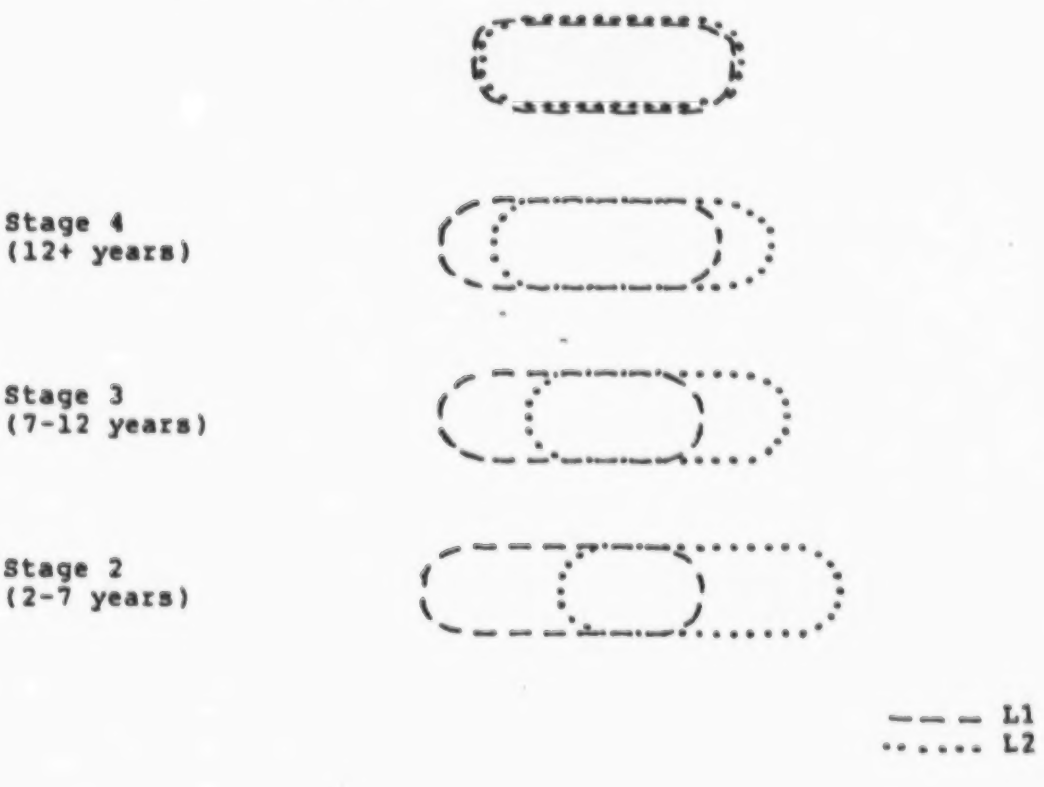

Fig. 3.3: Ultimate Attainment in L2 with Starting Age at Stage 2

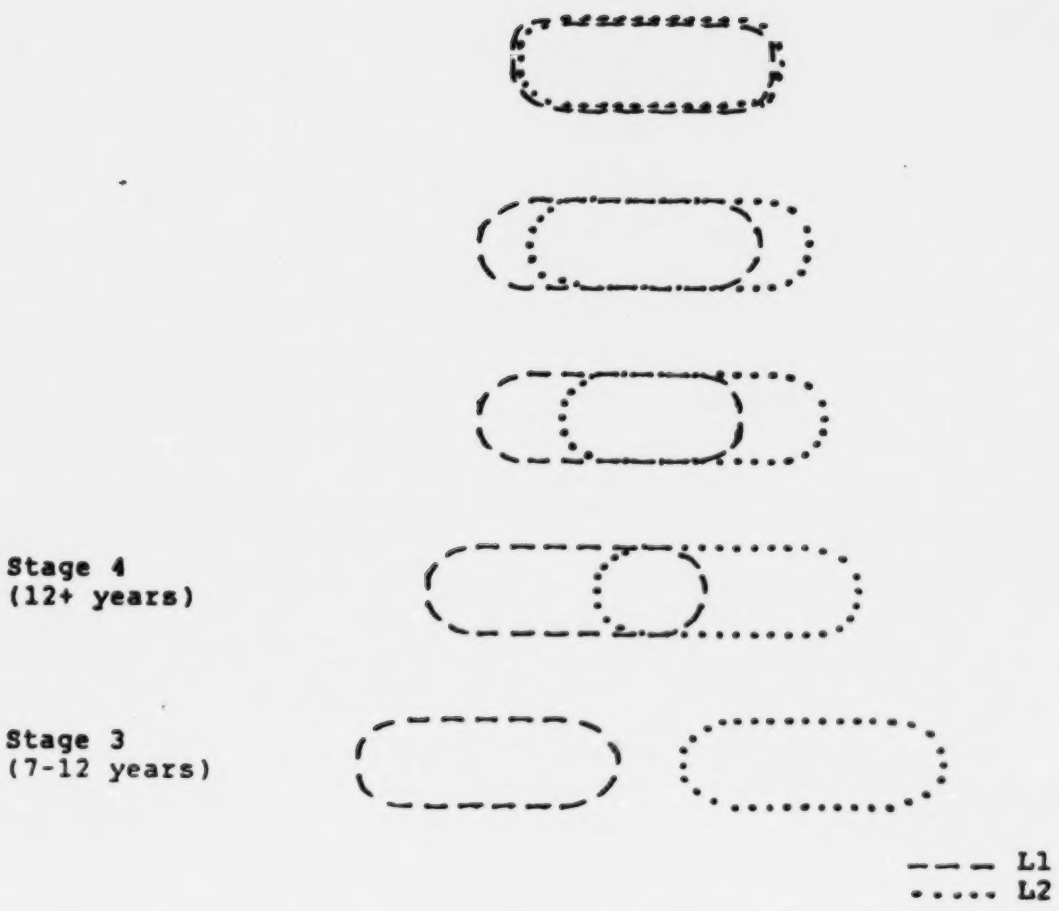

Fig. 3.4: Ultimate Attainment in L2 with Starting Age at Stage 3

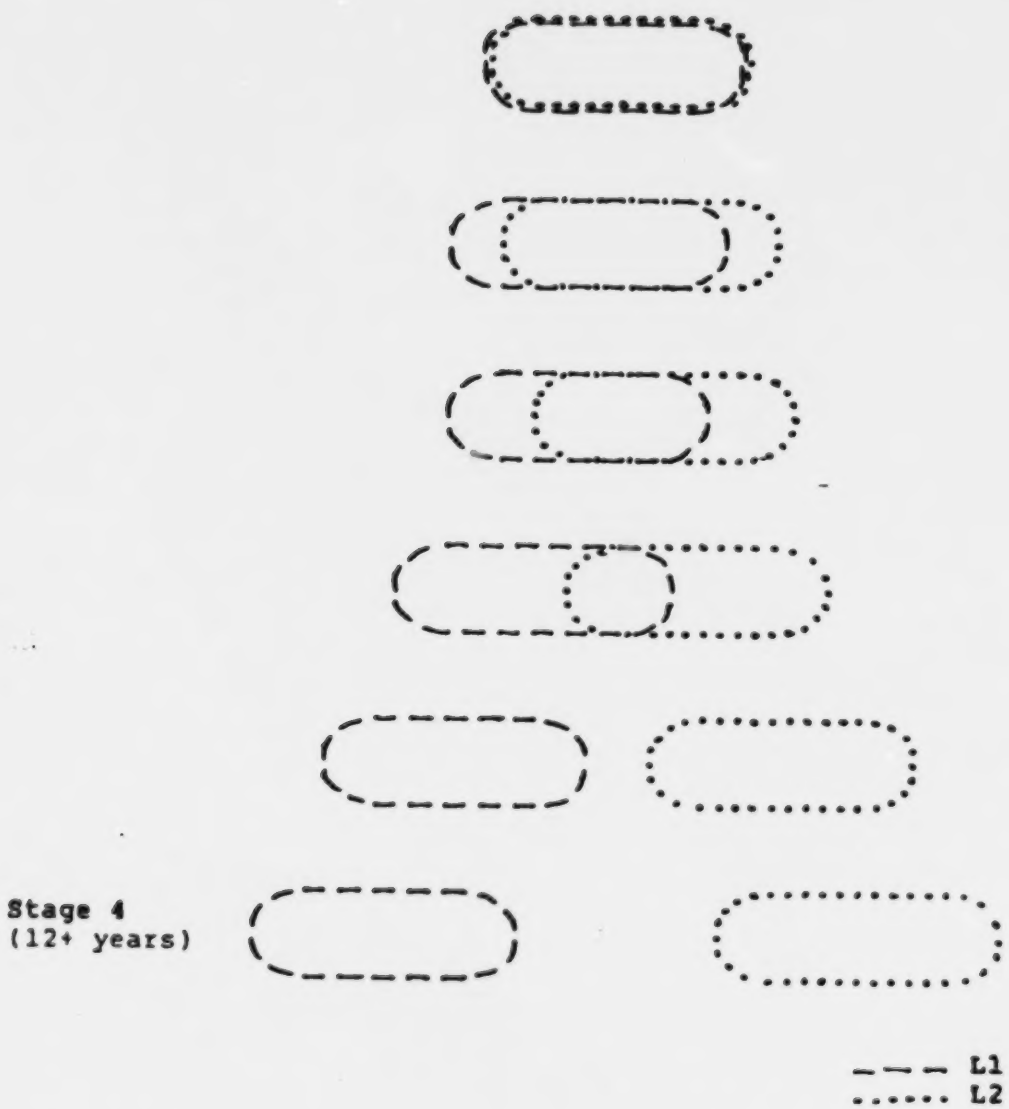

Fig. 3.4: Ultimate Attainment in L2 with Starting Age at Stage 4

CONCLUSION

The 'Disequilibrium' Model, although a hypothetical construct, was developed in an attempt, not only to bring together results of both long- and short-term studies, but more importantly to create a system through which age differences in rate and ultimate attainment in L2 acquisition could be conceptualized as a continuation of the same process - that is, the process of equilibration. No 'advantage' has been sought; nor, has there been any intention to show who - the young or older learner - is 'better' at L2 acquisition (as some researchers have gone to pains to do). It has been the writer's intention however, in reviewing the results of long- and short- term studies, and in considering the major factors investigated contributing to age differences in rate and ultimate attainment in L2 acquisition to conclude that it is not possible to hypothesize about an 'optimal age' to begin L2 instruction - as uniquely divorced from the 'optimal age' to begin instruction in any other subject area.

What can be hypothesized on the other hand, is that L2 accomodation is not a process which one can schedule, monitor or guarantee. What one can do is to try to characterize it and to look for the kinds of settings that may facilitate its occurrence. Attaining L2 proficiency in childhood or adulthood for example, is dependent upon the availability of environments providing what has been called 'disequilibrium' by Piaget (1964) in the the context of cognitive development, 'cognitive dissonance' by Festinger (1957) in the context of attitudes and beliefs, and 'conceptual conflict' by Berlyne (1965) in the context of teaching (60). Most importantly, in order to create the need for accomodation, motivation and attention must be aroused.

APPENDIX I

PIAGETIAN STAGES IN THE DEVELOPMENT OF THOUGHT

Characteristics of Operational Thought (2-7 years)	Characteristics of Concrete Operational Thought (7-12)	Characteristics of Formal Operational Thought (12+)
1. Perceptual dominance	1. Beginning of logical thought	1. Logical thought and beginning of theoretical thought
2. Focus on one dimension or factors	2. Can coordinate several dimensions or factors	2. Can focus on multiple hypothetical factors
3. Relatively rigid adherence to perceptions and beliefs	3. More fluid and transformational thought characterized by abilities to classify and re-classify	3. Ability for hypothetico-deductive thought
4. Non-conserving	4. Conserving	4. Ability to make and to correct predictions about conservation
5. Perceptual and movement representations internalized as in enactive representation	5. Logical thought dependent on concrete markers as in iconic representation	5. Logical and theoretical action in mind; the ability to figure in one's head as in symbolic representation

Characteristics of Operational Thought (2-7 years)	Characteristics of Concrete Operational Thought (7-12)	Characteristics of Formal Operational Thought (12+)
6. Identity rather than problem-solving	6. Problem solving tied to manipulation of objects	6. Propositional problem-solving
7. Action before without	7. Thought before or with action	7. Thought is or aciton thought
8. No sign of reversible thought	8. Reversals coordinated into a single system	8. Logical reversability assumed in predictions
9. Egocentric thought; sees one point of view	9. Can consider another point of view	9. Can consider, predict, and reconcile other points of view (metaphysical egocentrism)
10. Practical/ functional intelligence	10. Operational intelligence	10. Theoretical intelligence

Notes

1. Krashen (1981) uses the term 'acquisition' to refer to the subconscious process of 'picking up' a second language through exposure, and the term 'learning' to refer to the conscious study of a second language. However, as I believe that to a great extent 'acquisition' involves 'learning', and 'learning' involves 'acquisition'- thus rendering Krashen's distinction negligible, these two terms will be used interchangeably throughout this paper.

2. Snow, C.E., Age Differences In Second Language Acquisition: Research Findings and Folk Psychology. In K.Bailey, M.Long, and S.Peck (Eds.), Second Language Acquisition Studies. Rowley, MA: Newbury House, 1983

3. Krashen, S.D., M. Long, R.C. Scarcella (Eds.). Child-Adult Differences in Second Language Acquisition. Rowley, MA.: Newbury House, 1982

4. Ibid

5. See J. Piaget, Six Psychological Studies. New York: Vintage Books, 1968

6. McLaughlin, B. Second-Language Acquisition in Childhood: Volume 1. Preschool Children (Second Edition). Hillside, NJ.: Lawrence Erlbaum Assoc., Pub., 1984

7. Hakuta, K. Mirror of Language. New York: Basic Books, Inc., Pub., 1986

8. Krashen, S.D., M.H. Long and R.C. Scarcella. Age, Rate, and Eventual Attainment in Second Language Acquisition. In S.D. Krashen , M. Long, R.C. Scarcella (Eds.). Child-Adult Differences in Second Language Acquisition. Rowley, MA.: Newbury House, 1982

9. Ibid.

10. Hakuta, K. Mirror of Language.

11. Williams (1974), who studied the effects of length of exposure to the L2, found that the age at which subjects were initially exposed to the L2, made a difference in terms of rate of L2 acquisition.

12. Respectively: 25 minutes with total physical response teaching, measuring TPR; 10 sessions of 'phoneme drills' measuring pronunciation; 1 month to 1 year of natural exposure measuring pronunciation, morphology, imitation, and translation; and, 1 session in which 5 nonsense words, were repeated 20 times, and subjects asked to imitate, for pronunciation measure.

13. Ellis, R. Understanding Second Language Acquisition. Oxford University Press, 1986

14. Hakuta, K. Mirror of Language.

15. Hakuta, K. Mirror of Language.

16. See B. McLaughlin, Second-Language Acquisition in Childhood: Volume 1. Preschool Children (Second Ed.).

17. See D. I. Slobin, Psycholinguistics (Second Edition). Scott, Foresman and Co., 1979

18. Mace-Matluck, B.J. "Order of Acquisition: Same or Different in First- and Second- Language Learning?" The Reading Teacher, 1979

19. McLaughlin, B. Second-Language Acquisitiion in Childhood Volume 1. Preschool Children (Second Ed.)

20. That is, (a) older learners proceed through the early stages of syntactic and morphological development faster then younger learners; and (b) those who begin learning a second language in childhood generally achieve higher L2 proficiency than those who begin as adults.

21. 'Input' is used to refer to the language that is addressed to the L2 learner either by a native speaker or by another L2 learner (Ellis, 1986).

22. See R.C. Scarcella and C. A. Higa,"Input, negotiation and age differences in second language acquisition." Language Learning, 1981, 31

23. Scarcella, R.C. and C. A. Higa,"Input, negotiation and age differences in second language acquisition."

24.
Ellis, R. Understanding Second Language Acquisition.

25.
Krashen (1981) maintains that L2 acquisition is dependent on the availability of comprehensible input before the learner's internal processing mechanism can work.

26.
For example: motivation, attitudes, self-esteem and self-confidence.

27.
See J.H. Schumann, "Affective Factors and The Problem of Age in Second Language Acquisition". Language Learning, 1975, 25

28.
Krashen, S., Accounting for Child-Adult Differences in Second Language Rate and Attainment. In Child-Adult Differences in Second Language Acquisition. S.D.Krashen, M. Long, R.C. Scarcella (Eds.). Rowley, MA.: Newbury House, 1982

29.
See J. H. Schumann, "Affective Factors and The Problem of Age in Second Language Acquisition".

30.
Krashen (1982) argues that affective variables relate directly to acquisition, and not to conscious learning. Krashen's distinction here, between 'acquisition' and 'learning' can be seriously considered, since "conscious learning" of an L2 presupposes free-choice in doing so, and at least in most cases, involves highly motivated learners. However, Krashen's distinction between learning and acquisition is, once again, rendered negligible since highly motivated learners may in fact be instrumentally motivated.

31.
That is, they will have a lower socio-affective filter; the input will strike them 'deeper' (see Krashen, 1982).

32.
See J.H. Schumann, "Affective Factors and The Problem of Age in Second Language Acquisition".

33.
Again, the distinction is made here between 'conscious' learning and 'natural' acquisition. See Note 30 above.

34. For Chomsky however, there aren't separate stages of development based on changes in the child's mental capacities and on the interaction with the environment. Chomsky views the child as equipped with requisite knowledge from the beginning, only needing time to let that knowledge unfold. See M. Piatelli-Palmarini, Language and Learning. Cambridge, MA.: Harvard University Press, 1980

35. See M.A. Arbib, E.J. Conklin, and J.C. Hill, From Schema Theory to Language. New York and Oxford: OUP, 1987

36. Bruner (1966) has pointed out three levels of mental representation (enactive, iconic, and symbolic) corresponding to Piaget's stages of cognitive development.These are in turn related to language development (see Halliday 1973) in that, at the stage of enactive representation for example, the child responds not to what language IS - as does the older learner at the level of symbolic representation - but rather, to what language DOES.

37. See Appendix I for review of Piagetian Stages.

38. See J. Piaget, Six Psychological Studies. New York: Vintage Books, 1968; and, J.Piaget, The Language and Thought of the Child. New York:New American Library, 1974

39. See W.M. Rivers, Communicating Naturally in a Second Language. Cambridge University Press, 1983

40. Rosansky, E., "The Critical Period for the Acquisition of Language: Some Cognitive Developmental Considerations" Working Papers On Bilingualism, 1975

41. However, Vygotsky (1962) argues that use of language in communication is capable of advancing the child through the 'zone of proximal development' to higher levels of cognitive functioning.

42. McLaughlin, B., Second-Language Acquisition in Childhood: Vol. 1. Preschool Children (Second Edition)

43. Ibid.

44. Ellis, R., Understanding Second Language Acquisition.

45. See A.J. Romiszowski, Producing Instructional Systems. London and New York: Kogan Page, 1984

46.
Ellis, R., Understanding Second Language Acquisition.

47.
The term 'equilibration' was used by Piaget to refer to the actual process of achieving equilibrium, whereas the term 'equilibrium', to refer to the result. An equilibrated system moreover, is never static and closed, but always mobile and open, since each new level of equilibrium prepares for a new disequilibrium.

48.
Piaget, J., Six Psychological Studies.

49.
Dulay & Burt (1974) maintain for example, that "universal cognitive mechanisms are the basis for the child's organization of the target language."

50.
Basically, of form and function.

51.
Sampson, G.P., "Converging Evidence for a Dialectical Model of Function and Form in Second Language Learning". Applied Linguistics, 1982, 3

52.
See pp. 14-15

53.
See McLaughlin (1984), Hakuta (1986), and Hatch (1978)

54.
Hakuta, K., Mirror of Language.

55.
Ibid.

56.
In order to focus on differences, one must be capable of focusing on at least two dimensions or factors at the same time.

57.
Hakuta, K., Mirror of Language.

58.
That is, accomodation and assimilation of the L2.

59.
Keeping in mind however, that ultimate retention of two languages depends on a large number of factors, such as the prestige of the languages, cultural pressures, motivation, opportunities of use.

60.
Nussbaum, J. and S. Novick, "Alternative Frameworks, Conceptual Conflict and Accommodation: Toward a Principled Teaching Strategy". Instructional Science, 1982, 11

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